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BARROW STORM DAMAGE REDUCTION PROJECT



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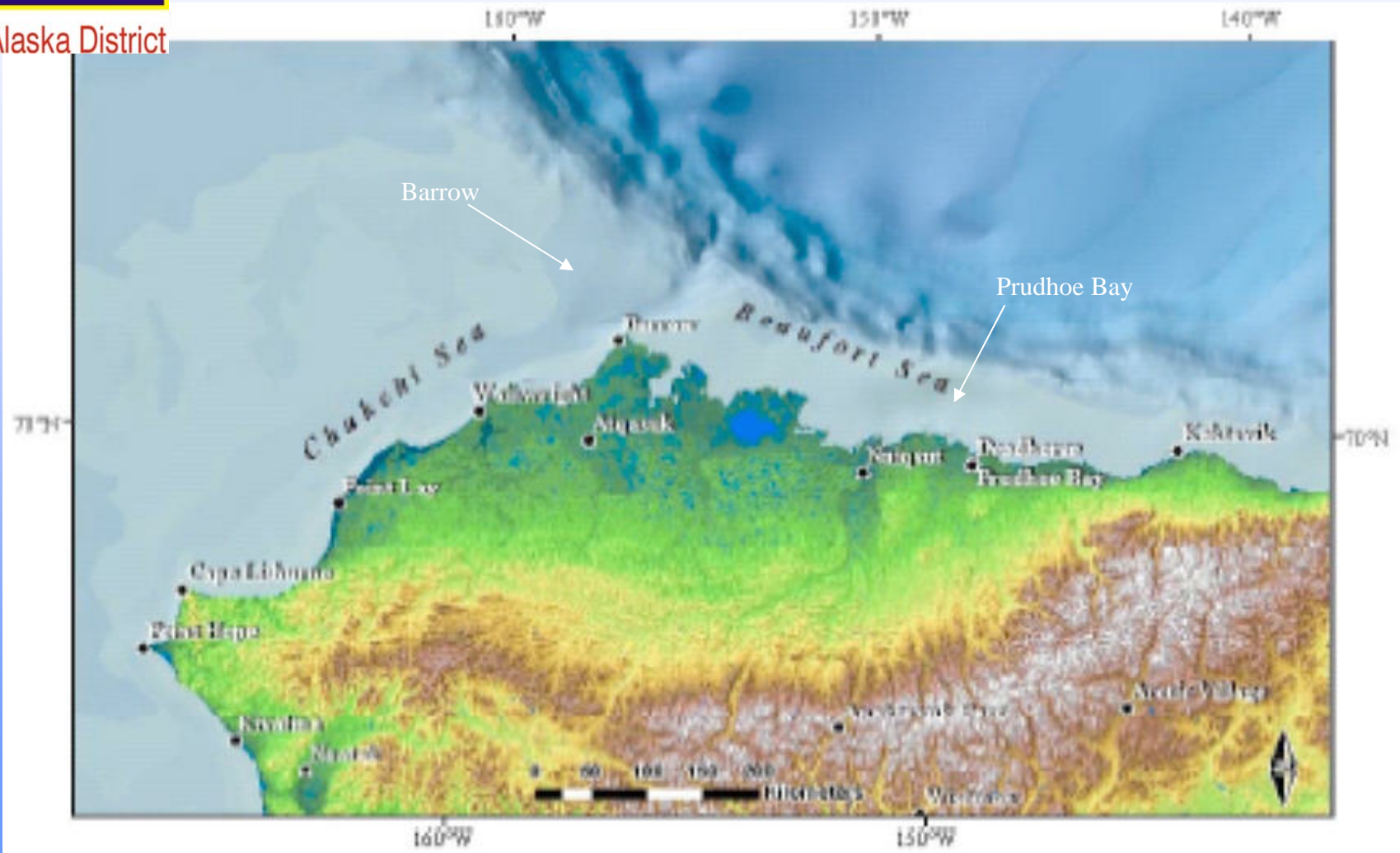
Alaska in Relation to the Continental United States





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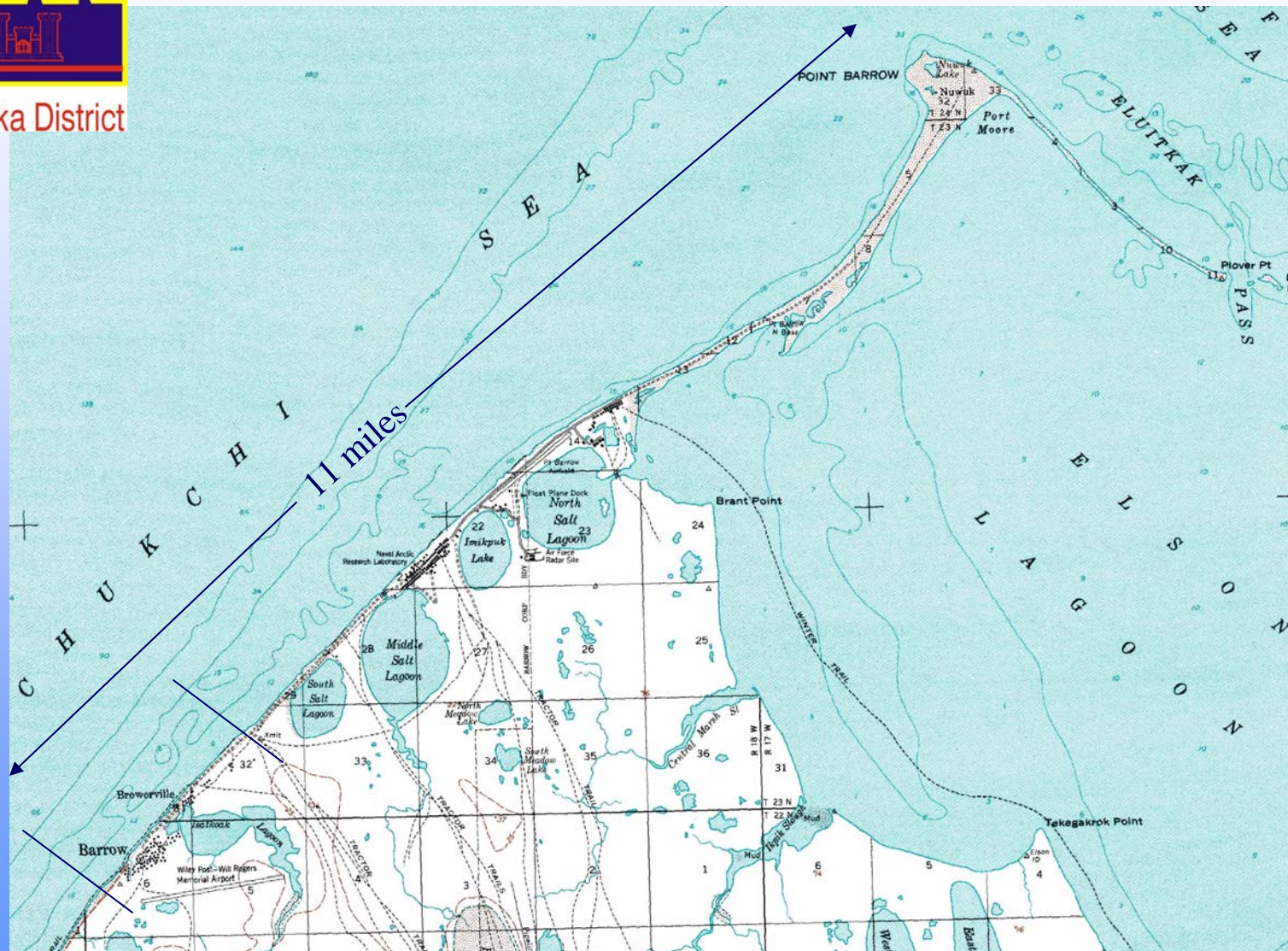
Point Barrow is at the convergence of the Chukchi and Beaufort Seas.





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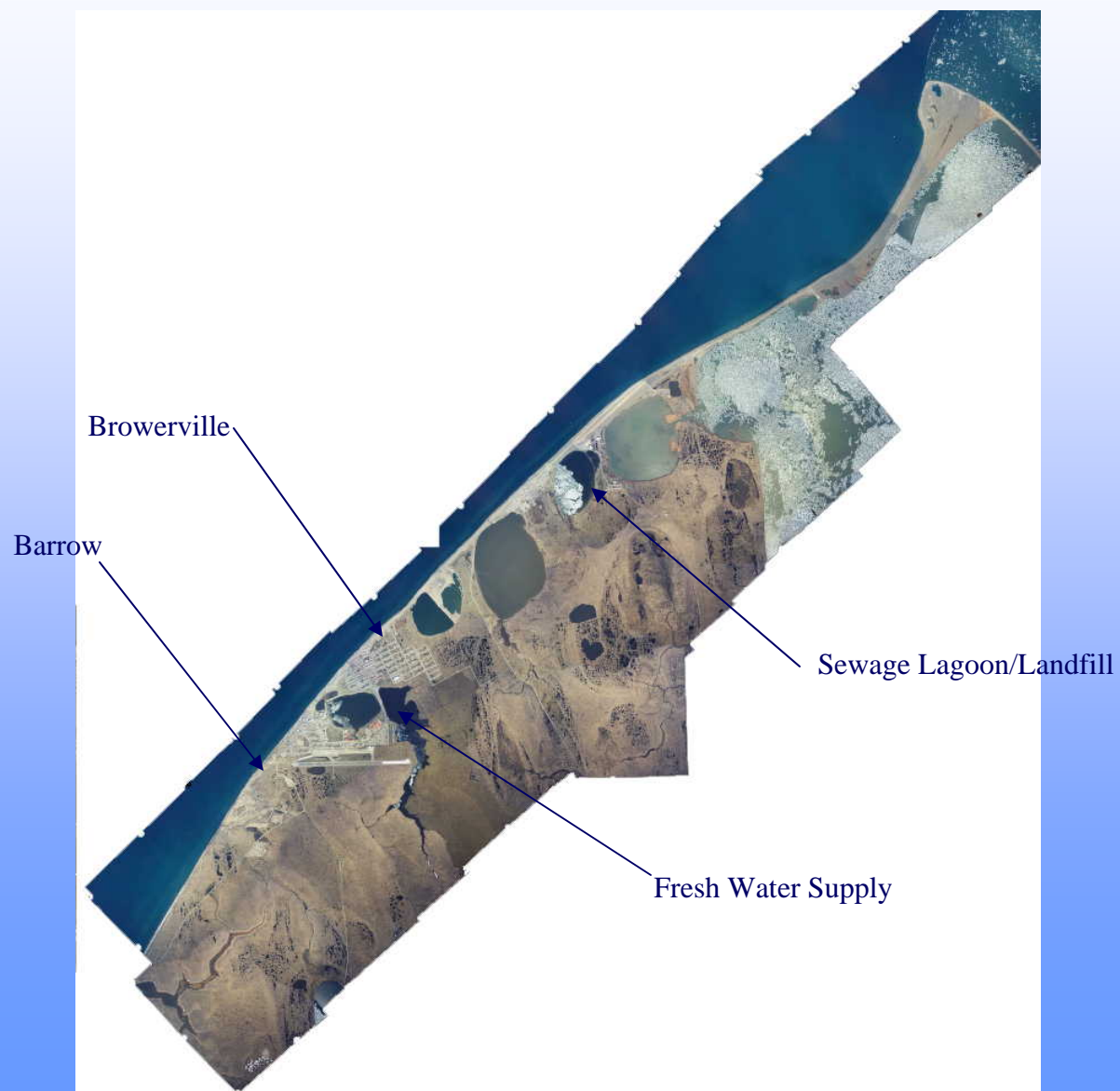
Primarily influenced by events in the Chukchi Sea. A 2.2 mile project would protect the City of Barrow and Browerville.





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Barrow Area Shoreline





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City of Barrow and Gravel Pit





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Barrow and Browerville





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Beach is fine to coarse sand with gravel. This fronts a silt bluff with permafrost. Bluff elevation of approximately 20 feet transitions to a low lying beach between the Cities of Barrow and Browerville



1/12/1999 04:12



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South coastline is characterized by a narrow sand/gravel beach backed by silty bluffs laden with permafrost





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Bluff feature reduces in height as you proceed north.





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Bluff feature is no longer present at Browerville





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Two issues at the site: flooding and bluff failure.

During the storm season the community was typically protected by ice. The ice has been staying out further and longer, leaving the community more vulnerable to storm effects.



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Bluff is in a weakened state due to melting permafrost and susceptibility to wave action. This is evidenced by fractures along the top of the bluffs.





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Bluff Failure from permafrost melting and wave action

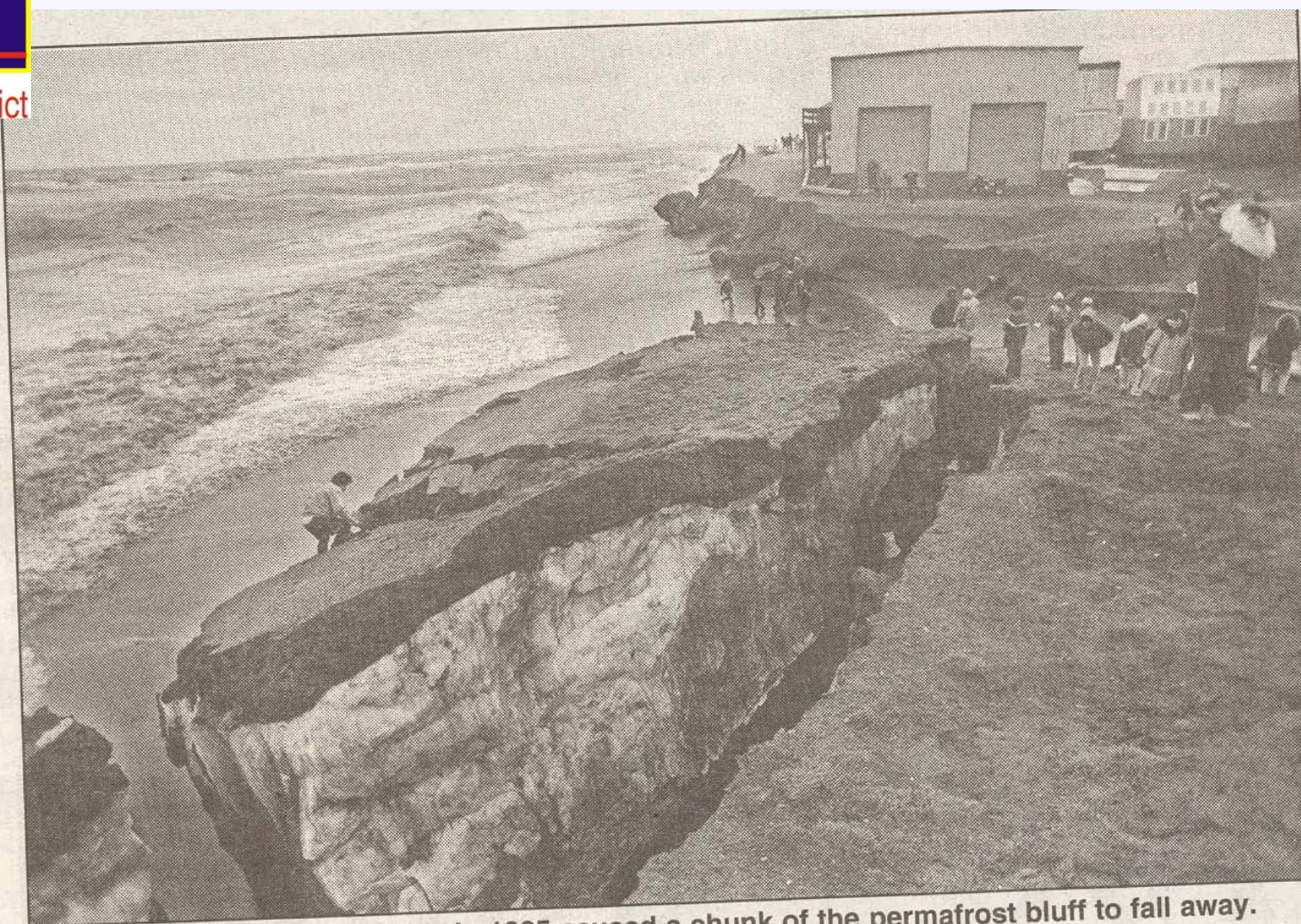


9/29/1999



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The bluff failure is generally in large sections



Autumn storms in Barrow in 1985 caused a chunk of the permafrost bluff to fall away.



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Smaller failures are in the form of mud flow where the bluffs become saturated and localized areas slump





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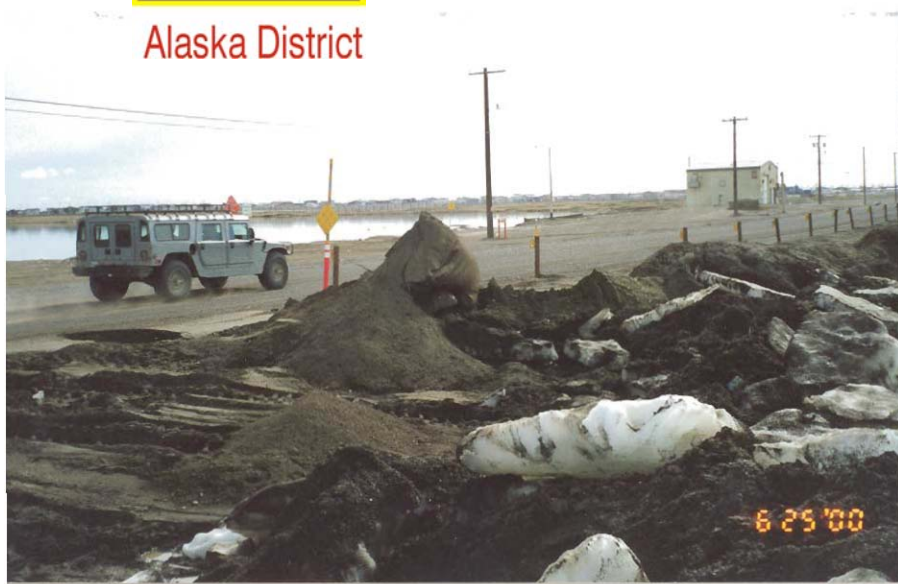
The beach material is worked every year by the ice.





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The effects of ice on the beach can be severe as in the case of an "ivu" where ice can advance quite far inland.





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The ice provides a damping of the wave climate and can exert considerable force on structures that may get in its way





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The ice has generally been staying offshore later into the summer, resulting in an increased window for storms to occur (2002).





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In addition to the bluff impacts, the storms bring flooding with water surge and wave set up effects (2002).





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During storm events heavy equipment is mobilized to push beach material up onto the beach (2002 storm).





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Material pile are placed along the road side constantly to provide sacrificial material during storm events





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Previous Beach and Bluff Protection Efforts



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Two erosion control efforts are shown in this photo. Supersack geotextile bags placed in front of the bluff at the most vulnerable part of the city and the remains of beach nourishment with fine material.





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The bought their own dredge in an effort to nourish the beach. The material that they dredged for nourishment was fine material that did not stay in place. This effort stopped when the dredge was grounded during a 2000 storm.



TIM MacDONALD / Arctic Sounder

The North Slope Borough's multimillion-dollar off-shore dredge was pounded by waves after it broke loose and grounded itself on the Barrow beach Thursday when a rare summer storm with winds up to 65 mph hit the area.



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By 2004 the beach nourishment material has been completely washed away and the supersacks are degrading from ice gouging and exposure.





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Along a stretch of beach in front of Browerville tar barrels were placed. They have stayed in place and the material surrounding them has varied.





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These have since become exposed and the beach narrows considerably in front of the boxes.





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HESCO Concertainer System by upturned utilidor boxes





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HESCO Concertainer System in front of Barrow





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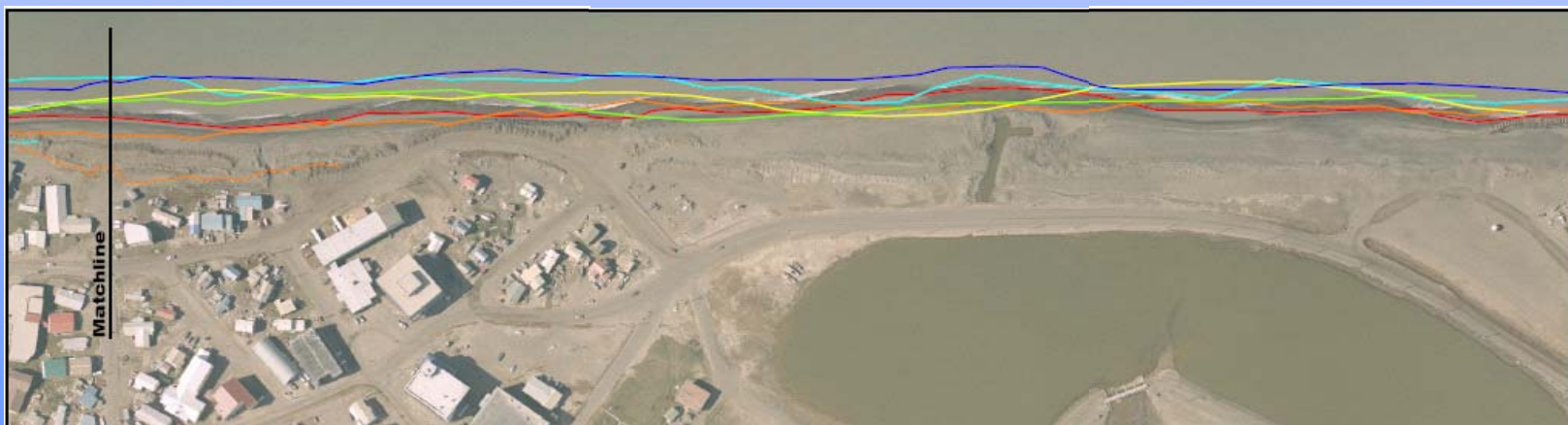
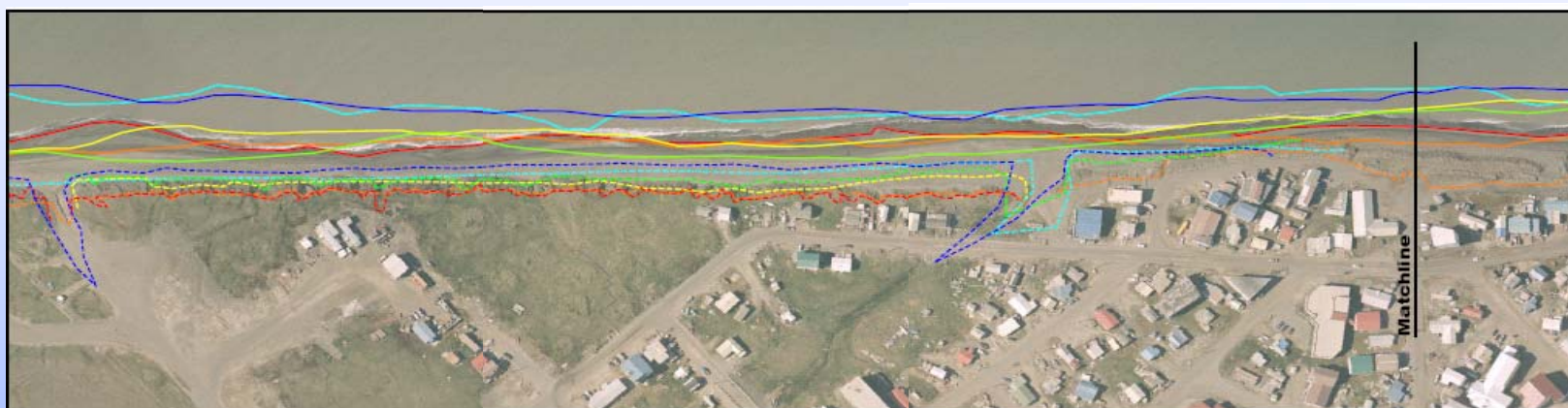
Analysis of the site indicates that the beach is relatively stable.



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Shore and Bluff Line Change Example of Analysis

Aerial Photography Analysis of the Shore line and Bluff line was performed for the years: 1948, 1955, 1974, 1984, 2003



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Corps of Engineers
Civil Works Branch

Interpreted Shoreline: 1948 1955 1974 1984 1997 2003
Top of Bluff: 1948 1955 1974 1984 1997 2003
0 100 200 300 400 Feet 0 50 100 Meters
1 inch equals 200 feet
Image dated August 2003



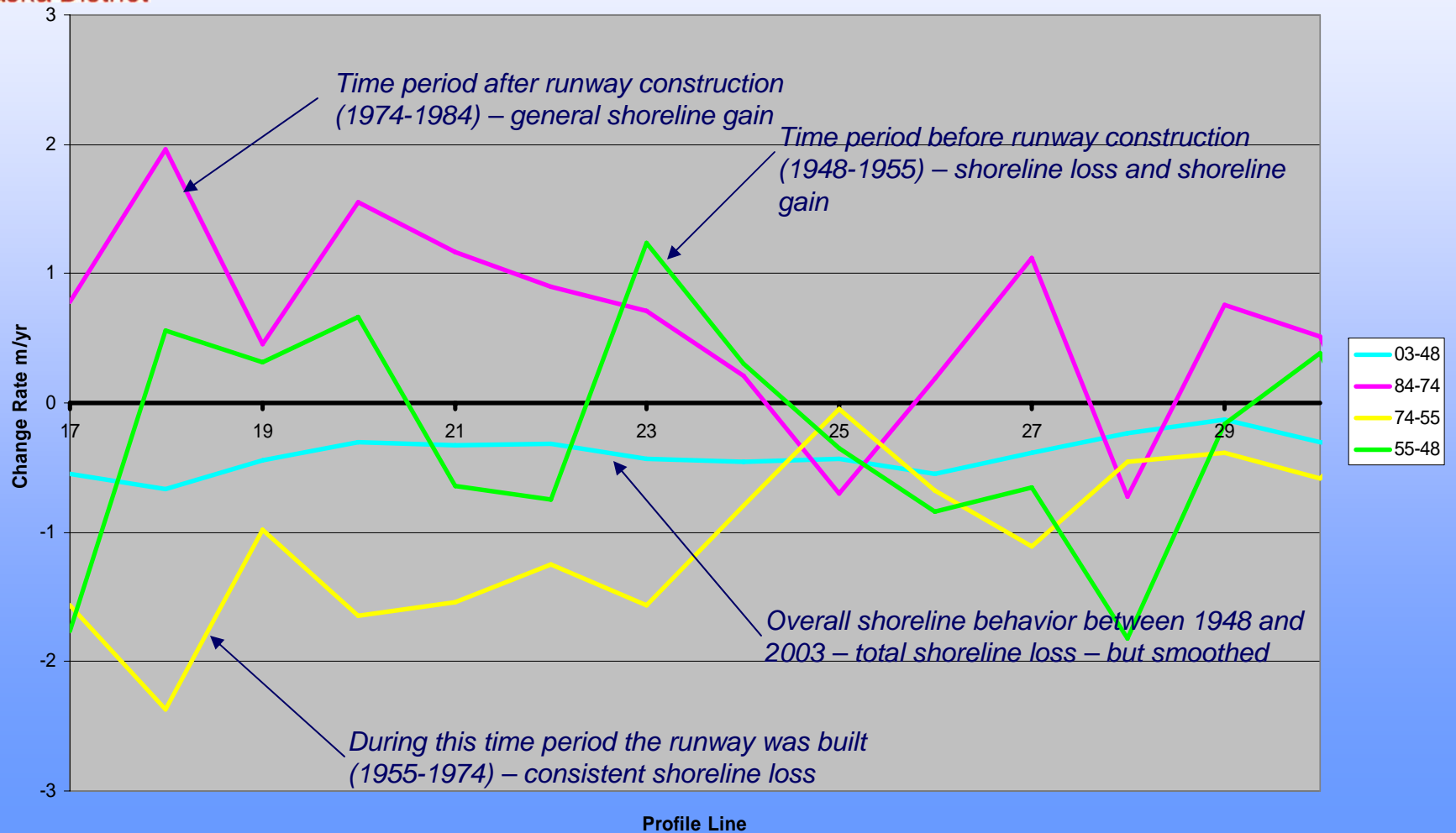
Shoreline Study
Barrow, Alaska

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Shoreline Recession Rate Between Stations 17 And 30





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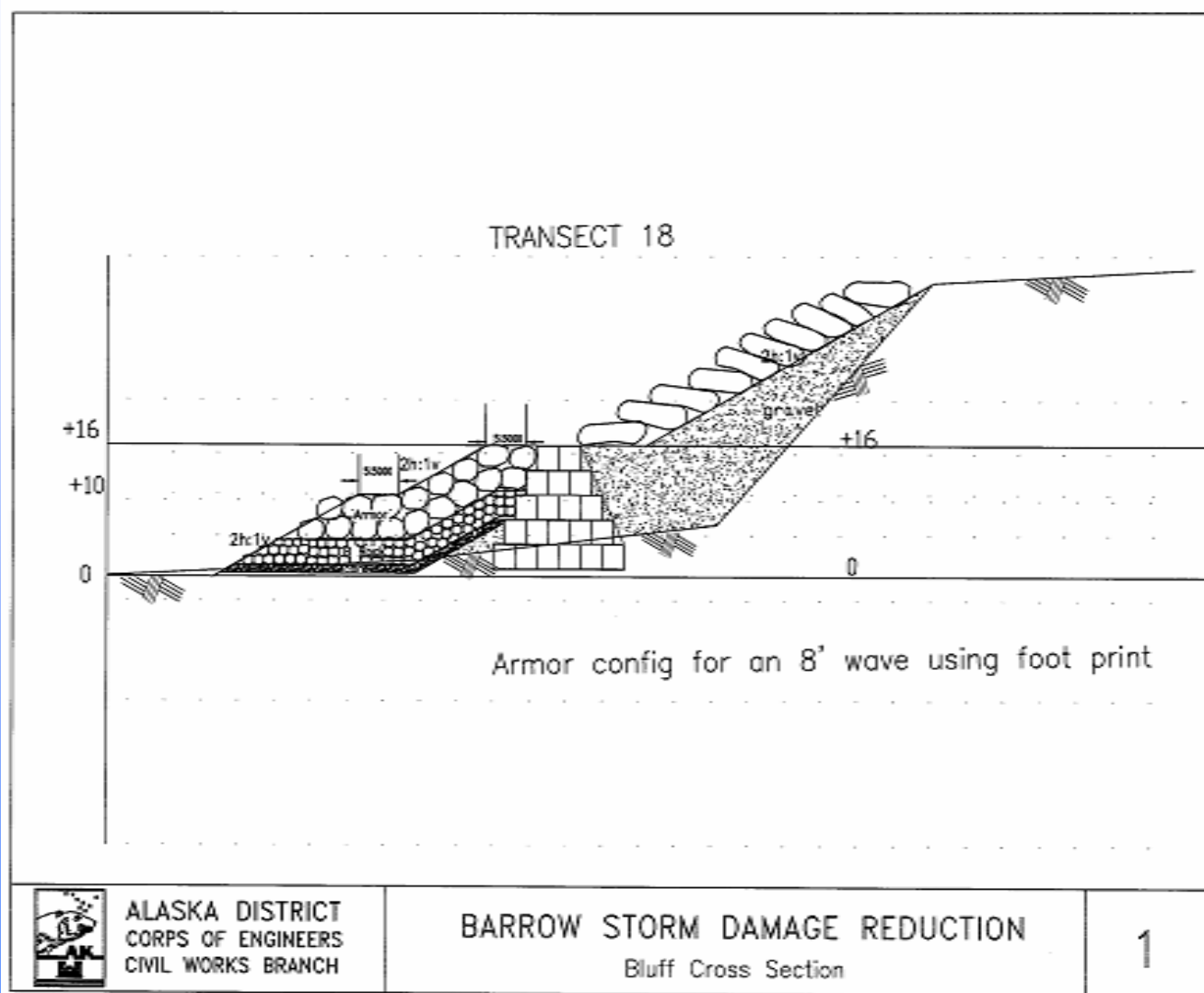
Aerial Photo Indicating Borrow From the Beach for the Airport





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Example Bluff Cross Section





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Example Dike Cross Section

